

1 WHAT IS CLAIMED IS:

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3 1. A method for inhibiting hydrate formation blockage in a flow line
4 transporting a hydrocarbon containing fluid, the method comprising:

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6 adding water to a hydrocarbon containing fluid to produce a water cut
7 enhanced hydrocarbon containing fluid; and

8

9 transporting the water cut enhanced hydrocarbon containing fluid
10 through a flow line under conditions that would be conducive for the
11 formation of hydrates in the original hydrocarbon containing fluid;

12

13 whereby hydrate formation blockage is inhibited from forming within the
14 flow line by the addition of the water.

15

16 2. The method of claim 1 wherein:

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18 sufficient water is added such that the water cut of the water cut
19 enhanced hydrocarbon containing fluid is at least 50%.

20

21 3. The method of claim 1 wherein:

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23 sufficient water is added such that the water cut of the water cut
24 enhanced hydrocarbon containing fluid is at least 75%.

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26 4. The method of claim 1 wherein:

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28 sufficient water is added such that the water cut of the water cut
29 enhanced hydrocarbon containing fluid is at least 85%.

1 5. The method of claim 1 wherein:

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3 sufficient water is added to lower the hydrate equilibrium temperature of

4 the water cut enhanced hydrocarbon containing fluid by at least 2°F

5 relative to the original hydrocarbon containing fluid.

6

7 6. The method of claim 1 wherein:

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9 sufficient water is added to lower the hydrate equilibrium temperature of

10 the water cut enhanced hydrocarbon containing fluid by at least 5°F

11 relative to the original hydrocarbon containing fluid.

12

13 7. The method of claim 1 wherein:

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15 salt is added to the water to increase the salinity of the water cut

16 enhanced hydrocarbon containing fluid.

17

18 8. The method of claim 7 wherein:

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20 the weight % of salt in the water cut enhanced hydrocarbon containing

21 fluid is at least 5%.

22

23 9. The method of claim 7 wherein:

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25 the weight % of the salt in the water cut enhanced hydrocarbon

26 containing fluid is at least 10%.

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28 10. The method of claim 7 wherein:

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30 the water phase of the water cut enhanced hydrocarbon containing

31 fluid is continuous; and

1 the water cut enhanced hydrocarbon containing fluid has a weight % of
2 salt of at least 5%.

3

4 11. The method of claim 1 wherein:

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6 the water is added to the hydrocarbon containing fluid at a sub sea
7 location.

8

9 12. The method of claim 1 wherein:

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11 sufficient water is added such that hydrate formation is self limiting as
12 hydrocarbon hydrate forming components in the water cut enhanced
13 hydrocarbon containing fluid are exhausted through the formation of
14 hydrate particles.

15

16 13. The method of claim 1 wherein:

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18 sufficient water is added such that the hydrocarbon containing fluid is
19 converted from an water in oil emulsion to a water continuous emulsion
20 thereby decreasing emulsion viscosity and reducing pressure drop in the
21 flow line.

22

23 14. A system for preventing the formation of hydrate blockage in a flow
24 line, the system comprising:

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26 a flow line for transporting a hydrocarbon containing fluid;

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28 a water injection conduit fluidly connected to the flow line to add water
29 to the flow line; and

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31 a hydrocarbon source which is in fluid communication with the flow line
32 to provide a hydrocarbon containing fluid to the flow line;

1 wherein water may be added to the flow line from the water injection
2 conduit to enhance the water cut of the hydrocarbon containing fluid.
3

4 15. The system of claim 14 wherein:

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6 the hydrocarbon source is a well bore.
7

8 16. The system of claim 14 further comprising:

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10 a water source fluidly connected to the water injection conduit; and
11 the water source is one of sea water, a sub sea water well or a water
12 source mounted on an offshore platform.
13

14 17. The system of claim 14 further comprising:

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16 a water separator fluidly connected to the flow line to receive fluids
17 containing hydrocarbons and water, the water separator being capable
18 of separating water from hydrocarbons.
19

20 18. The system of claim 17 wherein:

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22 the flow line, water separator and water injection conduit cooperate to
23 form a loop wherein water from the flow line may be separated by the
24 water separator and delivered back to the water injection conduit to be
25 reinjected into the flow line.
26

27 19. The system of claim 14 further comprising:

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29 a salt dispenser which connects relative to the flow line so that salt may
30 be added to increase the salinity of the hydrocarbon containing fluid.